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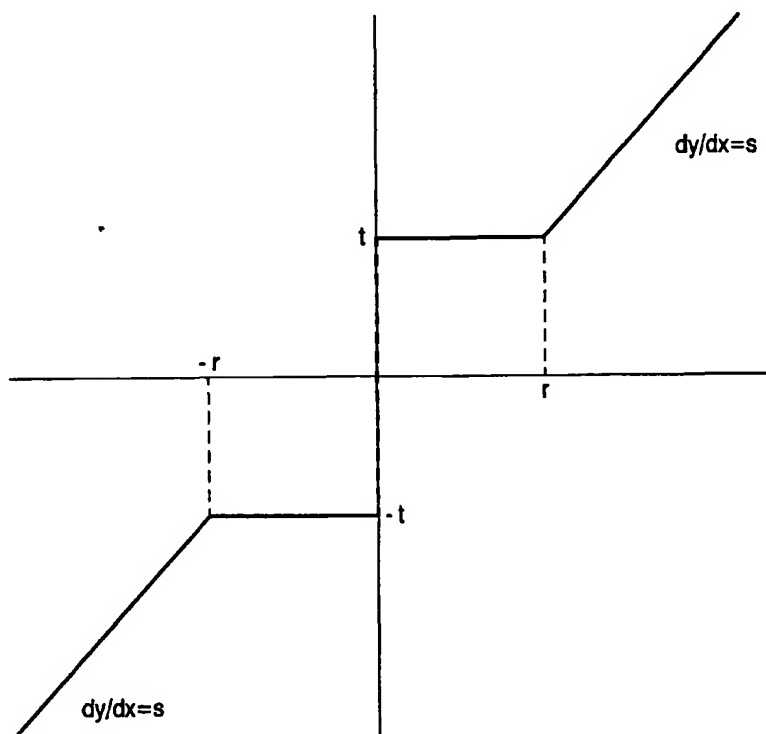
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[Continued on next page]

(54) Title: SIGMA-DELTA MODULATOR



(57) Abstract: A sigma-delta modulator (SDM) including  $n$  ( $n \geq 1$ ) integrators in series, where a first of the  $n$  integrators receiving an input signal, at least one Q device, which acts as a quantizer when an absolute value of a signal input thereto is smaller and as a gain element (either with or without offset) when the absolute value of the signal input thereto is larger, and a device for quantizing an output of the unit. The SDM may be a feed back or feed forward SDM. The SDM may include a single or multiple Q devices. The single Q device may be positioned so that the signal input to the one Q device is an output of the last integrator and the output of the one device  $Q_i$  is input to the device for quantizing and/or to the  $n$  integrators. For multiple Q devices, each of the Q devices may have different parameters set to improve stability, improve SNR, and/or reduce introduction of artifacts. The SDM may be part of an analog to digital converter and/or a digital to digital converter. The SDM may process digital or analog signals, for example, a 1-bit signal.

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Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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# INTERNATIONAL SEARCH REPORT

International Application No  
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**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7 H03M3/00

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6 064 326 A (KRONE ANDREW W ET AL) 16 May 2000 (2000-05-16) columns 1-10; figure 6	1-16
A	US 6 424 279 B1 (KIM BEOMSUP ET AL) 23 July 2002 (2002-07-23) column 1 - column 5; figure 4a	1-16
A	US 6 157 331 A (POH DAVID HO SENG ET AL) 5 December 2000 (2000-12-05) column 1 - column 8; figure 1	1-16

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Patent document cited in search report		Publication date	Patent family member(s)	Publication date
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US 6424279	B1	23-07-2002	KR 2001003899 A	15-01-2001
US 6157331	A	05-12-2000	NONE	